"Comparing Portfolio Selection Models of Markowitz and Single-Index: A Case Study of Amman Stock Exchange During 2000-2006"

"مقارنة نماذج إختيار المحفظة الاستثمارية لماركويتز والمؤشر المنفرد: دراسة حالة سوق عمان المالي خلال الفترة 2000-2006"

By:
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Supervisor

Prof.Ali Magableh

Submitted in partial fulfillment of the requirements of the master's degree in banking and finance at Yarmouk University

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الإهداء

إهـداء متواضــع إلــى والــدي الــذي لا يــزال أثــره وســيبقى ماحييــت فــي وجداني.. رحمه الله.

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List of Abbreviations

MPT	Modern Portfolio Theory
Marko	Markowitz model
SIM	Single-index model
ASE	Amman Stock exchange
NYSE	New York Stock Exchange
B	Beta Coefficient
VAMP	value-added minus payroll
QP	Quadratic programe
VAR	Value-at-risk
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
AMEX	American Stock Exchange
OLS	Ordinary least squares
ARMA	Autoregressive moving average
AA	Asset allocation
DAX	Deutscher Alctien Index
ISE	Istanbul Stock Exchange
CAPM	Capital Asset Pricing Model
AFM	Amman Financial Market
GAs	Genitic Algorithms Techniques
JSC	Jordan Securities Commission
SDC	Securities Depository Center
FEAS	Federation of Euro-Asian Stock Exchanges
WFE	World Federation of Exchanges
IOSCO	International Organization for Securities Commissions
ANNA	Association of National Numbering Agencies
ISIN	International Security Identification Numbers
ETS	Electronic Trading System
NIKKEI	Securities of Japan provided daily data which covered all the companies listed on the first section of the Tokyo Stock Exchange.
MENA	Middle East and North Africa

Abstract

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The purpose of this study is to apply the Markowitz and single-index models to test the risk-adjusted performance of stocks portfolios formed .using the monthly closing prices of 115 companies listed in ASE, and ASE index during the period 2000 -2006. The importance of this study arises from that the application of these elementary developed models, offers better options for decision making in the choice of optimal portfolios in Amman Stock Exchange. The results of the study showed that there is no significant difference between the two tested models, and the number of stocks in the portfolios constructed do not affects the result of comparing the two portfolio selection models. When the portfolio selection models are very important as a risk test, the investors should take into consideration when they select their portfolios.

Chapter one:

Introduction

1.1 Preface

In the modern investment setting investors are faced with a complicated task of selecting good investments. In addition to this they have to consider trade-offs between risk and return and finally they are required to combine various types of investments in an optimal portfolios. A rational investor alawys tries to minimize risk and maximize return on his investment. To reach the optimal portfolios. Investors should aim to maximize the level of return for a given level of risk. Alternatively they aim at minimizing the risk for a given level of return. This is done by constructing a portfolio of assets which as a whole is subject to the investors.

While most of the studies were carried out in developed countries, only limited numbers of studies have been conducted in less developed countries.

The purpose of this study is to test whether Markowitz or Sharpe model (single-index model) of portfolio selection offer better investment alternatives to investors in Amman Stock Exchange (ASE).

1.2 Problem of the Study:

The portfolio selection models are very essential for investors in order to select their investment, Markowitz model is the best normative model of stock selection available by using full covariance matrix, while sharpe who noticed that considerable savings could be explained by a single index of the market, since prices of all securities often tend to rise and fall at the same time. It was felt that most of the covariances between securities could be explained by a reference to a single market index. Sharpe decided to compute a line of best fit for each stock with the market index using least squares regression analysis. So, the main problem of this study is the investors confusion because he can not decide which model he will select also, the difficulty of performance Markowitz model.

1.3 Importance of the Study

The importance of this study arises from the fact that the application of these fundemental models developed, an offer to investors for making decision in the choice of optimal portfolios in Amman Stock Exchange.

The comparison of these models is very important for investors to choose the appropriate one to construct their portfolios.We correctly assert that the

appropriate variance for the portfolio selection model reflects portfolio risk, that should measure the risks created not only by the inherent fluctuations of returns, but also by the decision makers who has lack of a perfect information about the parameters of models. It is advantageous for this study to conduct an empirical analysis that have entered into actual portfolio selection decisions.

1.4 Objective of the study

The main objectives of this study are to:

1. Evaluate the risk-adjusted performance of stocks portfolios formed from ASE using Marko model and the single-index (SIM) model (Sharpe).
2. Proceeds to compare, with a sample, the results of the full covariance (Markowitz model) and the results of index model.
3. Examine how the Markowitz model performs relative to the single index model in portfolio selection process.
4. Provide the investors in ASE with completed information in order to help them in portfolio selection process.

1.5 Study hypothesis

According to the objective of the study we can conclude the following hypothesis:

H10: There is no difference in analytical process for portfolio selection in term of risk, between Markowitz and single index models, in ASE.

H11: There is a difference in analytical process for portfolio selection in term of risk, based on the Markowitz and single index models, in ASE.

H20: The Single Index is not a better investment alternative as a portfolio selection model in ASE.

H21: The Single Index is a better investment alternative as a portfolio selection model in ASE.

H30: The Markowitz model is not a better investment alternative as a portfolio selection model in ASE.

H31: The Markowitz model is a better investment alternative as a portfolio selection model in ASE.

1.6 Study Methodology:

This study presents a methodolgy, which combines two approaches, the first one represent the Markowitz (1952) model and the second one is the Single-Index Model (Sharpe 1964) by applying those two models in study sample .

1.7 Structure of the study

The study is structured as follows. Chapter one gives an introduction of the study, the objectives and importance of the study, hypothesis and the data sources. Chapter two shows the theoretical background. Chapter three provides a brief review of literature review. Chapter four provide information about ASE. Chapter five clarified the data and methodology of the thesis. Chapter six explained the empirical results. Finally the conclusions and recommendations will be provided in the last Chapter 7.

Chapter Two: Theoretical Framework

2.1 Introduction

The goal of this chapter is to provide a complete, accurate, describe historical information about study, and easily understandable explanation of MPT and portfolio construction.

2.2 History and Development of M PT

Modern portfolio theory was developed by Harry Markowitz in (1952). He extended this theory to value a stock according to the present value of its expected future dividends. The next stage in the development of the portfolio theory was to include a riskless asset. Motivated by Keynes' theory of liquidity preferences, Tobin developed this idea in 1958. Tobin discovered that the set of efficient risk-return combinations was a straight line. He also found that an efficient portfolio of both risky and riskless assets can be achieved by combining two portfolios, one consisting only of risky assets and another one of the risk-less asset.

Sharpe (1963) simplified this process by introducing an approach known as the market model or SIM. In this model it is assumed that the return on each asset is linearly related to an index. The motivation for this is that most of the time stock returns move together. Therefore it is natural to believe that a single factor determines most of the cross-sectional variations in returns. The

linear relationship can be estimated by least squares and the estimated coefficient is used to construct the covariances, which in turn are used to construct the optimal portfolio (Tobin, 1958).

2.3 Markowitz Model

Markowitz's pioneering work on portfolio analysis is described in his 1952 journal of finance article and subsequent book in 1959. The fundamental assumption underlying the Markowitz approach to portfolio analysis is that investors are basically risk-averse. This simply means that investors must be compensated with higher return in order to accept higher risk. Markowitz then developed a model of portfolio analysis that can be explained as follows. First, the two relevant characteristics of a portfolio are its expected return and some measure of the dispersion of possible returns around the expected return, the variance is analytically the most tractable. Second, rational investors will choose to hold efficient portfolios, those that maximize expected returns for given level of risk or, alternatively, minimize risk for a given level of return. Third, it is theoretically possible to identify efficient portfolios by the analysts of information for each security on expected return, variance of return, and the interrelationship between the return for each security and for every other security as measured by the covariance. Finally a computer program can use

these inputs to calculate the set of efficient portfolio. The program indicates the proportion of an investor's fund that should be allocated to each security in order to achieve efficiency, the maximization of return for a given level of risk or the minimization of risk for a given expected return (James and Farrell 1997).

In 1952 Harry Markowitz, Nobel Prize holder, laid down the basis for modern investment theory; Markowitz focused the investment professions attention on mean-variance efficient portfolios. A portfolio is defined as a mean-variance efficient one, if it has the highest expected return for a given level of risk (variance) or if it has the lowest variance for a given level of expected return. Certain principles of this portfolio theory are fundamental: decision makers are risk-averse; they prefer portfolios with high returns and low risk (Better, 2006).

According to Correia, Flynn, Uliana & Wormald (2000), Harry Markowitz (1952) was a pioneered in modern portfolio theory, and later Sharpe (1964) was. Markowitz developed the basic portfolio model, according to Reilly and Brown (2003) the variance of return is a measure of portfolio risk under the following assumptions:

1. Investors will evaluate an investment opportunity as being presented by a probability distribution of expected returns over some period of time;
2. Investors maximize one-period expected utility, and their utility curves demonstrate diminishing marginal utility of wealth;
3. Risk of a specific investment will be measured by the deviation from expected return;
4. Investors' utility curves are functions of risk and return only; and
5. For a given level of risk, investors will aim to maximize the level of return.

Under the above assumptions the efficient portfolio will be considered as the one having the higher expected return at a given level of risk, or lower risk at a given level of expected return.

Markowitz model was theoretically elegant and conceptually sound. However, its serious limitation was the volume of work well beyond the capacity of all expects a few analysts. To resolve the problem William F. Sharpe developed a simplified variant of the Markowitz model that reduces substantially its data computational requirements" (Sharpe.W.1963).

The problem with the Markowitz model is that it is complex and it can be intractable when we are dealing with a large number of securities. Advances

in computing hardware and software have reduced the computational headaches associated with the Markowitz model. What we need, however, is an alternate formula for portfolio variance that is capable of dealing with large populations of stocks" (Haugen, 1993).

2.4 Markowitz Diversification

The particular form of diversification activity implied by modern portfolio theory is called Markowitz diversification, This type of diversification differs from simple diversification, used widely by security salespeople and described in traditional investments text. These sources define diversification as "spreading your risks." Simple diversification ignores the covariances between securities and often results in extra diversification. Markowitz diversification implies combining securities with less than perfect positive correlation in order to reduce risk in the portfolio without sacrificing any of the portfolio's return. In general, the lower the correlations (or, equivalently, covariance's) of the assets in a portfolio, the less risky the portfolio will be. This is true regardless of how risky the assets of the portfolio are when analyzed in isolation (Alexander and Francis, 1986).

"In the 1950s, Harry Markowitz, considered the father of modern portfolio theory, originated the basic portfolio model that underlies modern portfolio

theory. Before Markowitz, investors dealt loosely with the concepts of return and risk. Investors have known intuitively for many years that it is smart to diversify, that is, not to "put all of your eggs in one basket". Markowitz, however, was the first to develop the concept of portfolio diversification in a formal way. He showed quantitatively why, and how, portfolio diversification works to reduce the risk of a portfolio to an investor. (Jones, 1996).

"Markowitz diversification may be defined as the process of combining assets that are less than perfectly positively correlated in order to reduce portfolio risk without sacrificing any portfolio returns. It can sometimes reduce risk below the systematic level. Markowitz diversification is more analytical than simple diversification and considers assets correlations (or covariances). The lower the correlation between assets, the more it will be able to lower risk" (Francis, 1986).

2.5 The single-index model

William Sharpe, who among others has tried to simplify the process of data inputs, data tabulation, and reaching a solution, has developed a simplified variant of the Markowitz model that reduces indeed its data and computational requirements. Markowitz model was theoretically elegant. However, its serious limitation was the sophisticated and volume of work well be beyond the markowitz model.

William Sharpe's pioneering achievement in this field was contained in his essay entitled to Capital Asset Prices: a Theory of Market Equilibrium under Conditions of Risk (Sharpe 1964). As per Sharpe model or portfolio optimization model, the linearity of security should be found. The beta of security, represents the market linearity of the stock. The market influences each stock. Security that provides lower rate of return than risk-free rate of return is rejected as investment alternative because such stocks entail some investment risk but they are not compensating the investment risk (Paudel and Koirala, 2006).

Index models has the ability of dealing with large population of stocks and serve as simplified alternatives to the full-covariance approach to portfolio optimization. Although the single-index model gives a simple formula for portfolio risk, it also makes an assumption about the process generating security returns. The accuracy of the single-index model's formula for portfolio variance is as good as the accuracy of its assumption (Haugen, 1993).

Following Markowitz, "William Sharpe, developed the single-index model, which relates returns on each security to the returns on a common index. A broad market index of common stock returns is generally used for this

purpose. Think of the Standars and Poor (S&P) 500 as this index. The single-index model can be expressed by the following equation:

$$R_i = \alpha_i + \beta_i R_M + e_i$$

Where

R_i = *the required rate of return on security i*

R_M = *the average of all returns in the market index of return*

α_i = *that part of security, return independent of market performance*

β_i = *a constant measuring of the expected change in the dependent variable,* R_i, *given a change in the independent variable,* R_M

e_i = *the random residual error.*

The single-index model divides a security's return into two components: a unique part, represented by α_i, *and a market-related part, represented by* $\beta_i R_M$. *The unique part is a micro event, affecting an individual company but not all companies in general. The error term is the difference between the left-hand side of the equation, the return on security i, and the right-hand side of the equation, the sum of the two components of return. Since the single-index model is, by definition, an equality, the two sides must be the same".(Jones.G.1996).*

According to Hanink & Cromley (1987) the purpose of the single index model was to reduce the computational time required in applying the Markowitz model, but without significant loss of information. The Markowitz full covariance model characterizes a portfolio by the two basic parameters of mean and covariance of asset returns (Hanink and Cromley, 1987).

Essentially, the single-factor model assumes that security returns are correlated for only one reason. Each security is assumed to respond, in some cases more and in other cases less, to the pull of a single factor, which is usually taken to be the market portfolio. As the market portfolio makes a significant movement, nearly all stocks go up with it. Some stocks price rise more than others, but as the observation of stock prices movement over time, it is assumed that variability in the market portfolio accounts for all of the comovement among the stocks. This is, in fact, the assumption of the single-factor model: The model assumes all the numbers in the covariance matrix can be accounted for by the fact that all the stocks are responding to the pull of this single, common force (Haugen, 2001).

Merton (1971) introduced the notion of dynamic portfolio management, arguing that means and variances of returns are not constant over time and investment strategies should reflect any changes in the market conditions.

Other researcher such as Kraus and Litzenberger (1976) offered an alternative portfolio theory by including other moments that might more precisely describe the distribution of portfolio returns. Fama (1970) also introduced a multi-period solution, however, he found that the behavior of the consumers in the multi-period problem is indistinguishable from that of a risk avert consumer in the single period problem. Elton and Gruber (1997) found that the portfolio problem could be declared as finding the portfolio that is tangent to the risk-less asset line in the efficient frontier space. This tangency portfolio maximizes the ratio of expected return minus the return on the risk-less asset to the standard deviation.

2.6 Risk

Hagin (1979) defined risk as the possibility that the actual return for an investment will differ from the expected return. Reilly and Brown (2003) considered standard deviation as an appropriate measure of risk because it:

1. is somewhat intuitive.
2. is correct and widely recognized; and
3. has been used in most theoretical asset pricing models.

In finance, risk is the probability that an investment's actual return will be different than expected. This includes the possibility of losing some or all

of the original investment. It is usually measured by calculating the standard deviation of the historical returns or average returns of a specific investment. However, these methods are also hard to understand. The mathematical difficulties interfere with other social goods such as disclosure, valuation and transparency. In particular, it is often difficult to tell if such financial instruments are "hedging" (purchasing/selling a financial instrument specifically to reduce or cancel out the risk in another investment) or "gambling" (increasing measurable risk and exposing the investor to catastrophic loss in pursuit of very high windfalls that increase expected value).As regret measures rarely reflect actual human risk-aversion. Such an individual would willingly (actually pay a premium to) assume all risk in the economy and is hence not likely to exist. In financial markets, one may need to measure credit risk, information timing and source risk, probability model risk, and legal risk if there are regulatory or civil actions taken as a result of some "investor's regret". "A fundamental idea in finance is the relationship between risk and return. The greater the amount of risk that an investor is willing to take on, the greater the potential return. The reason for this is that investors need to be compensated for taking on additional risk." Depending on the nature of the investment, the type of 'investment' risk will vary. High risk

investments have greater potential rewards, but you may lose your money instead by taking the risk for more money.

A common concern with any investment is that you may lose the money you invest; your capital. This risk is therefore often referred to as capital risk. If the assets you invest in, are being held in another currency there is a risk that currency movements alone may affect the value. This is referred to as currency risk. Many forms of investment may not be readily salable on the open market (e.g. commercial property) or the market has a small capacity and may therefore take time to sell. Assets that are easily sold are termed liquid therefore this type of risk is termed liquidity risk (wikipedia.com, March 2008).

2.7 Return

According to Farrell (1997) the expected return on a portfolio calculated as the sum of the weighted average expected return on the individual assets that make up the total portfolio.

(Fischer& Jordan 1999) considered that return is the motivating force and the principle reward in the investment process and it's the key method available to investors in comparing alternative investments.

2.8 Summary

The main purpose of this chapter is to show the theoritical background of the Markowitz and SIM models, risk, return, and to know the main similiraties and differeneces between the two models.

2.9 The main similiraties and differences between Markowitz and SIM models

1. The SIM model is more simple and easy to apply than Markowitz model.
2. The Markwoitz model is more complicated.
3. The SIM model saves more effort and time than Markwoitz does.
4. Markwoitz and SIM models are very closed and they are used to test the same variable.

Chapter Three: Literature Review

3.1 Introduction

Many of the studies previously conducted were based on Markowitz's model or the Sharp's Single Index Model, as tools to investigate issues in portfolio. Most of the studies were carried out in developed countries, only limited numbers of studies have been conducted in less developed countries.

3.2 International studies

In his study, Sharpe **(1963)** "A simplified Model for Portfolio Analysis" described the advantages of using a particular model of the relationship among securities for practical applications of the Markowitz portfolio analysis technique. Data were gathered on the annual returns during the period 1940-1951 for 96 industrial common stocks chosen randomly from the New York stock exchange (NYSE). The returns of each security were then related to the level of a stock market index and estimates of the parameters of the diagonal model obtained. Moreover, preliminary evidence suggests that the relatively few parameters used by the model can lead to very nearly the same results obtained with much larger sets of relationships among securities. The possibility of low-cost analysis, coupled with possibility that a relatively small amount of information need be sacrificed make the model an attractive candidate for initial practical applications of the Markowitz technique.

We observed that thise study applied only the Markowitz model in order to describe the relationship among securities. Therefore, we will review another studies most related to our study.

Wallingford& Buckner **(1967)** study "A Survey and Comparison of Portfolio Selection Models" compared the results of full covariance (Markowitz) model with single-index model (Sharpe). The data which used, an analysis of 100 securities, the security analyst must estimate 100 returns expectations, 100 variances, and 4950 covariance's, a total of 5250 items of data, the problem is further complicated by the fact that few individuals are capable of estimating such sophisticated measures as variances and covariance's, in addition, the IBM 7090, one of the largest and fastest modern computers, can handle a total of only 300 securities. According to Sharpe model considerable savings could be achieved if all of the covariances between returns could be explained by a single index of the market. And to compute a line of best fit for each stock with the market index using least squares regression analysis. The result of study that, the great achievement of the Markowitz portfolio selection model was its ability to explain the phenomenon of diversification theoretically, the size and complexity of this model, however, made it impractical as a tool for decision making,

Simplifications, such as Sharpe-index diagonal model have reduced the size of the model to manageable proportions, but more research appears fruitful.

We observed that these study described and used the two models but does not reached to the level of the research purpose.

Frankfurter,Phillips & Seagle (1976) "Performance of the Sharpe Portfolio Selection Model : A comparison" viewed the Markowitz and Sharpe portfolio selection approaches as alternative analytic processes for portfolio selection; showed that the Sharpe approach is based on Markowitz model, but adds the simplifying assumption that "The returns on various securities are related only through common relationship with some basic underlying factor". Monte Carlo trials were used to generate independent annual returns for each security. The samples consisted of 100 replication each for histories of 5, 10, and 19 years in length. The result of study that under conditions of certainty, the Markowitz and Sharpe approaches will arrive at the same decision set, in the experiment. However, Sharpe approach outperformed the standard Markowitz approach in its ability to discriminate against inefficient portfolios, and to select efficient ones. These results demonstrate that under conditions of uncertainty, Sharpe approach has potential advantages over the Markowitz approach. They find that variation in performance is explained in terms of the two essential differences in the models:

1. Fewer, and different, estimators are used in the Sharpe model to summarize past history.

2. The linear assumption of the Sharpe model does not necessarily hold. They found finally that in experiments, the Sharpe process performs now here worse than Markowitz process, and gives superior results when only short data histories are available. We observed that Frankfurter& seagle (1976) study is much related to the research but it is compared, and judged the models by using some words like superior or worse than.

Elton, Gruber & Padberg (1978) "Simple Criteria for Optimal Portfolio Selection: Tracing out the Efficient Frontier", assumed the existence of a risk free asset and hence a unique optimum portfolio. To show how this assumption can be relaxed they used a simple technique to generate the full efficient frontier, and to find all linear combinations of corner portfolios. This technique allows the construction of the full efficient frontier. They demonstrated how to find the efficient frontier for two cases: the Single Index model and a model assuming the correlation coefficient between all stocks is identical. They examine both the case where short selling is allowed and the case where it is disallowed. The results showed how the procedures constructed, under the assumption of unlimited lending and borrowing at the risk less rate, can be extended to trace out the full efficient frontier. We

observed that this study used only the Single Index Model under the assumption of lending and borrowing riskless rate.

Hill & Schneeweis (1983) study "International Diversification of Equities and Fixed-Income Securities", examined the efficient set of portfolios selected from a choice set that includes returns derived from domestic and international corporate bond and government bond indices as well as domestic and international stock indices. They examined the extent to which international and domestic fixed income securities are included in efficient frontier, the effect on efficient set composition of using the Sharpe portfolio selection model as compared to the Markowitz portfolio selection model, and the correspondence between expected and realized portfolio risk and return for the different portfolio selection models by using monthly stock market index values, government and corporate bond yields, and exchange rates for nine countries over the period January 1969 to December 1979. The Sharpe and Markowitz portfolio selection models are run on exchange rate adjusted security returns in the international asset sample to provide minimum risk corner portfolios at various return levels. The Markowitz model employs security return estimates and the variance/covariance matrix for security returns. The necessary inputs of the Sharpe portfolio algorithm are based on Sharpe's single index market model. The results indicated that the use of

estimates for portfolio selection process that rely on either long or short-term historical return data do not materially affect portfolio composition.

Barnes (1985) "Markowitz Allocation-Fixed Income Securities" Evaluated the risk-adjusted performance of bond portfolios formed using the Markowitz allocation technique. Quarterly returns are calculated for each bond in a sample composed mainly of corporate, over an investment period, 1969-1978. Using a sample of American and Canadian corporate bonds and American government bonds. The results showed that the average correlation coefficient for both the American and Canadian samples are sufficiently low to warrant attempts to diversify in a systematic fashion, also the Markowitz model does poorly when only ex-post raw data are used to form all expectations. There are significant improvements in portfolio risk-adjusted performance; however, as maturity bias is removed from the raw data used to form expectations. The results showed that this type of research is to improve upon the set of bond expectations to test the usefulness of Markowitz diversification. This set of expectations would be free of maturity bias and would be provide a more credible test of the Markowitz model. This study characterized by applied the Markowitz Model on a portfolios consisted of corporate and government bonds.

Hanink & Cromley (1987) "Basic Portfolio Models for Interregional Analysis", demonstrated the utility of mean-variance portfolio models (Markowitz and single-index) in interregional analysis. The particular type of analysis partitions the economy of a region into national and local components of business or economic cycles. Using macro-regions of the U.S. as an example, contrasts the portfolio theoretic approach to more conventional analysis. The variable employed consists of annual measures of value-added minus payroll(VAMP) over the period 1963-1978.The results provided an evidence that mean-variance portfolio models are worthwhile tools for interregional analysis. The results also showed that the recognition of portfolio risk in investment accounts for interregional cross-investment, which is inexplicable in a neoclassical world. Future empirical research should include more comprehensive testing of the interregional single-index portfolio model.

Turvey, Driver & Baker. (1988) "Systematic and Nonsystematic Risk in Farm Portfolio Selection" Investigated the potential use of systematic and nonsystematic risk in modeling farm operating plans. The data used were generated from aggregate provincial prices and yields from 1972-1983 for Ontario. An equally weighted index of gross revenue for twenty-eight crop and livestock activities was used. Three models were formulated from a common data set and the results were compared. The models were a full

variance-covariance quadratic program (QP), a Single-Index based diagonal QP model, and a model minimizing the portfolio beta. The results showed that minimizing the portfolio beta provides solutions almost identical to the full variance-covariance QP. Results of a single-index diagonal QP model showed a smaller percentage portfolio variance error, as compared to the full variance-covariance QP, because nonsystematic risk is included. It is suggested that Single-Index based programming models may prove to be practical alternatives for deriving mean-variance-efficient farm plans.

Yamazaki & Konno (1991) "Mean-Absolute Deviation Portfolio Optimization Model and its applications to Tokyo Stock Exchange", demonstrated that a portfolio optimization model using the mean absolute deviation risk function can remove most of the difficulties associated with the classical Markowitz model while maintaining its advantages over equilibrium models. In particular, the mean absolute deviation risk model lead to a linear program instead of a quadratic program, so that a large-scale optimization problem consisting of more than 1000 stocks may be solved on a real time basis, numerical experiments using the historical data of NIKKEI 225 stocks. The results showed that the mean absolute deviation risk model can be used as an alternative to Markowitz's risk model and generates a portfolio quite

similar to that of the Markowitz model within a fraction of time required to solve the latter.

Board & Sutcliffe (1994) "Estimating Methods in Portfolio Selection and the Effectiveness of Short Sales Restrictions: UK evidence", forecasted the means variances and covariance's by applying portfolio selection models examined the relative performance of various estimators and the effectiveness of short sales, the data was obtained from the London share price database which contains monthly dividends adjusted, logarithmic returns for UK companies quoted on the London stock exchange for 175 companies between February 1955 and December 1982. Its performance was compared with seven other forecasting methods, and with three non-Markowitz portfolio selection techniques. When short selling is permitted, the overall mean and the single index models performed well in estimating the covariance matrix. The results strongly suggest it is beneficial to select a portfolio containing more than one asset, and this is only achieved if some alternative portfolio selection technique is used. The result showed that the short sales decision has been found to be considerably more important than the choice of estimation method in improving the performance of actual portfolios. The relatively good performance of the non-Markowitz techniques and of the simplistic overall mean method is an interesting finding as it suggests that sophisticated

portfolio selection techniques and forecasting methods may not offer significant benefits over much more straightforward methods.

Shachmurove (1989) "Portfolio Analysis of Latin American Stock Markets.", examined the strategy of investing in seven Latin American emerging stock markets: Mexico, Brazil, Argentina ,Colombia, Peru, Venzuela, and Chile. The daily stock market returns international portfolio investment during July 7, 1994 to December 30, 1994 is used as the basis of the analysis. Using the optimization algorithms include Markowitz variance-covariance and lower partial moment. The study generated an optimal portfolio and evaluated with appropriate performance measures. The results showed there are real dangers in foreign investment. The foreign exchange risk and sovereign risk. The foreign currency denominated return will have a lower real value following an adverse change between relative values of two currencies. Sovereign risk refers to the possibility of intervention in foreign markets by the domestic governments; nevertheless it is beneficial for the contemporary investor to possess a well diversified portfolio, rather than to limit his investments to a single market.

Ledoit & Wolf (2003) "Improved Estimation of the Covariance Matrix of Stock Returns with an Application to Portfolio Selection", estimated the covariance matrix of stock returns by an optimally weighted average of two

existing estimators: the sample covariance matrix and single-index covariance matrix. Using NYSE and AMEX stock returns from 1972 to 1995. The result showed they developed a flexible method for some structure into a large dimensional estimation problem, namely the problem of estimating the covariance matrix of a large number of stock returns. The result also reduced the dependence on multifactor models, which are surrounded by unresolved questions about the number of factors and their identity. They compared the performance of the shrinking method to that of various previously suggested estimators for the covariance matrix of stock returns. Performance was measured in terms of out of sample standard deviation of minimum variance stock portfolios, where the estimated covariance matrix is the input of the well known portfolio selection method of Markowitz (1952). Their method improved upon all the other estimators included in the study.

Edward, Ying & James (2005) "A Dynamic Decision Model for Portfolio Investment and Assets Management", addressed a dynamic portfolio investment problem and discussed how we can dynamically choose candidate assets, achieving the possible maximum revenue and reduce the risk to the minimum level. They generalized Markowitz's portfolio selection theory and Sharpe's rule for investment decision. An analytical solution is presented to show how an institutional or individual investor can combine Markowitz's

portfolio selection theory, generalized Sharpe's rule and Value-at-Risk (VAR) to find candidate assets and optimal level of position sizes for investment (dis-investment), by constructed two portfolios using five years of daily data of the price of several stocks collected from the Bloomberg (is an information network that permits instantaneous access to real-time financial data. This network is run by Bloomberg L.P Company). The time period is from December 5th, 1997 to December 5th, 2000. The result showed that the generalized Markowitz's portfolio selection theory and generalized Sharpe's rule improve decision making from investment.

Biglova & Rachev (2007) "Portfolio Performance Attribution" Provided further insight into the performance attribution by development of statistical models with additional constraints on Asset Allocation (AA), Selection Effect (SE), and TEVA by the portfolio managers (S). Using daily returns of 30 stocks traded on the German Stock Exchange and included in the DAX30-index during 07/10/2003 -02/03/2007. The benchmark portfolio is the equally weighted portfolio of DAX30-stocks. The portfolio optimization is based on minimizing the downside movement of the DAX-portfolio from the benchmark subject to constraints on AA, SE and S. They investigated also the distributional properties of AA, SE and S sequences by testing the Gaussian distribution hypothesis versus stable Paretian hypothesis. They proposed an

empirical comparison among suggested portfolio choice models comparing the final wealth, expected total realized return of the optimal portfolio, and performance ratios for obtained sequences of excess returns. The result showed the strongly reject sequences the normality assumption in favor of the stable Paretian hypothesis.

Celik (2007) "Risk & Return Relationship in the Portfolio of Banks' Common Stocks NYSE Versus ISE", analyzed banking sector in USA and Turkey focusing on 18 biggest banks' common stocks and measured the risk of common stocks and show their relations with the market portfolio's return based on theoretical framework of modern portfolio theory and Capital Assets Pricing Model (CAPM), and also analyzed a specific types of investment instruments (common stocks) from a specific sector (banking sector) for certain period of time (one year, 2006). Calculating systematic risk indicator, beta, for nine biggest banks' common stocks and examine their risk & return relationship in context of modern portfolio theory and CAPM based on daily return for 2006 in Turkey. The results showed that market risk indicator, beta, of Turkish banks' common stocks is much higher than those of USA. There is not any negatively correlated common stocks in American banks' common stocks on the contrary of one negatively correlated common stocks in Turkish banks' common stocks. The results showed also that the volatility of American

banks' common stocks are lower than those of Turkish, and the risk & return relationship is not totally supported by CAPM.

4.3 Arabic and Less Develop Countries Studies

Omet (1995) "On the Performance of Alternative Portfolio Selection Models.", compared the efficient frontiers that result from the Markowitz and Single Index models, using listed companies on the Amman Financial Market (AFM). The study covered the time period from 31December 1991 to 31June 1993,started on December 1991 because before December 1991 AFM's index was not weighted by market capitalization of companies. The results show that the two models are not different from each other. In other work, investors might be able to use the more practical approach in generating their efficient frontiers, in other word, one might be able to use the SIM model, which is a lot more practical than the Markowitz model in generating AFM efficient frontier.

We see that Omet study is much related to our research but there are some differences like the period of study, the sample, the portfolio structure, and the analytic process because no software packages used by the research as (Omet 94) concentrated on the efficient frontier.

Omet and Lutfi (1999) evaluated a number of techniques designed to predict the systematic risk (β) of stocks that are listed in ASE through the period 1987 -1997. Data were provided from ASE. These are the market monthly share price index and monthly closing price of 32 actively-traded companies during the study period. The time period was divided into three equal periods. By applying the market model, three betas were estimated for each company using ordinary least squares. The estimates of betas from the first period were ranked in ascending order to examine the stationarity of these betas; the number of securities per portfolio was allowed to vary over 1 and 2 securities. Then the rank order correlation coefficient was measured between beta values for the ranked portfolios in the first subperiod and their corresponding beta in the second sub period. Similarly the product moment correlation was measured to determine the strength of the relationship that exists between the two variables. After that the coefficient were calculated between the second and third sub periods. The results indicated the existence of a linear relationship between beta values and the first sub period and the second sub period. This relationship was stronger if the estimated betas depend on multi-security portfolios. Furthermore, the existence of the relationship was not sufficient to predict beta with good accuracy.

Al-Qudah et al. (2004) "How Many Securities from a Well-Diversified Portfolio in an Emerging Market (Developing Countries)? A Case Study of Amman Stock Exchange", examined the effect of diversification on the portfolio riskness in ASE over the period 1996-2001. The sample consists of 82 listed stocks, and the methodology based on the Markowitz Model (1952). The results assured the existence of a significant statistical relationship between portfolio size and the risk reduction. However, the t-test stated that the significant reduction benefits of diversification were virtually exhausted when a portfolio contains 10-15 stocks. Moreover, investors should implement marginal analysis in order to determine the number of stocks required in a well-diversified portfolio.

Segot and Lucey (2005) "Capital Market Integration in the Middle East and North Africa and its Implications for International Portfolio Allocation" investigated the capital market integration in the MENA countries and its implications for an international portfolio investment allocation. Using four co-integration methodologies, rejected the hypothesis of a stable, long run relationship between each of these markets and the European Monetary Union, the USA, and the regional benchmark. Data were obtained from Datastream International using single index for cross-market comparisons and a common currency for segmented markets. Used also daily indices ranging

from 1998-2004. The markets are those of Morocco, Tunisia, Egypt, Lebanon, Jordan, Turkey and Israel. They Adopted an empirical methodology consist of three steps. First, used a variety of bi-variance co-integration techniques between the stock market and the international benchmark. Second, investigated the time varying nature of equity market integration. Third, adjusted the latte by market capitalization ratios in order to assess the portfolio allocation implications of market integration. The results showed that the MENA markets seem to display heterogeneous reactions to financial, economics and political events and should therefore not be treated as a block for global allocation purposes. The results showed also that Israel and Turkey are the most promising markets in the region. They are followed by Egypt, Jordan and Morocco, while Tunisia and Lebanon seem to be lagging behind.

Paudel and Koirala (2006) "Application of Markowitz and Sharpe Models in Nepalese Stock Market" tested whether or not Markowitz and Sharpe models of portfolio selection offer better investment alternatives to Nepalese investors. By applying those models in a sample of 30 stocks traded in Nepalese stock market during 1997-2006. The results showed that the application of these elementary models developed about a half century ago offer better options for making decision in the choice of optimal portfolios in Nepalese stock market.

Abdelazim & Wahba (2006)"An Artificial Intelligence Approach to Portfolio Selection and Management", addressed the portfolio selection and management problem, modern portfolio theory and Markowitz efficient frontier using Artificial Intelligence techniques and Genitic Algorithms Techniques (GAs) to construct an optimal portfolio. GAs are tested on two stock markets, the US stock market, represented by a pool of 40 US companies during 2000-2002, and the Egyptian stock market, represented by a pool of 37 companies during 1998-2000. The research result found that, even in bearish market periods, the optimally selected portfolio, which was weekly managed using Neural Networks, was able to generate positive returns utilizing the Markowitz Efficient Frontier. The result also demonstrated the usefulness of applying the proposed approach represented by Genetic Algorithms and Neural Networks in active portfolio selection and management.

4.4 Summary

The majority of literature review which are showed in this chapter are use software packajes in order to get their results, while as our is study used manual method by using spss and excell programs, also our study concentrates on comparison between the two selection models in term of risk.

Chapter Four: Amman Stock Exchange

4.1 An Overview of the Stock Exchange Market in Jordan

Financial securities market is a place where suppliers and demanders of financial securities meet to exchange a certain security. This includes money market where short term securities are traded such as commercial papers and capital markets for trading long term securities such as stocks.

Amman Financial Market (AFM) was established in 1978. During the 1980's and early 1990's the market grew in an unbalanced way, and by the mid of 1990's it was necessary that a further restructuring of the market was required to increase its size and liquidity. According to that, the Jordanian government moved to upgrade the capital and new securities law was presented (securities Law No.23 of 1997).

The Securities Law of 1997 separated the functions of the AFM and created the Jordan Securities Commission (JSC), the Amman Stock Exchange (ASE) and the Securities Depository Center (SDC).

4.2 Jordan Securities Commissions(JSC)

The JSC is a regulatory entity that monitors the ASE and SDC. The JSC has financial and administrative independence, and is linked directly to the prime minister. This independence enhances its ability to supervise the capital market. In addition to its supervisory role, the JSC aims to protect market participant and ensure transparency, fairness and efficiency in transactions (jsc.gov.jo, March 2008).

4.3 Amman Stock Exchange (ASE)

The ASE was established in March 1999 as a non-profit, private institution with administrative and financial autonomy. It is authorized to function as an exchange for the trading of financial securities. The exchange is governed by a seven-member board of directors. A chief executive officer oversees day-to-day responsibilities and reports to the board. The ASE membership is comprised of Jordan's 65 brokerage firms.

The ASE is committed to the principles of fairness, transparency, efficiency, and liquidity. The exchange seeks to provide a strong and secure environment for its listed securities while protecting and guaranteeing the rights of its investors. To provide this transparent and efficient market, the ASE has

implemented internationally recognized directives regarding market divisions and listing criteria.

To comply with international standards and best practices, the ASE works closely with the Jordan Securities Commission JSC on surveillance matters and maintains strong relationships with other exchanges, associations, and international organizations. The exchange is an active member in the Union of Arab Stock Exchanges, Federation of Euro-Asian Stock Exchanges (FEAS), a affiliate member in the World Federation of Exchanges (WFE), and an affiliate member in the International Organization for Securities Commissions (IOSCO).The ASE is charged with: providing enterprises with a means of raising capital by listing on the Exchange, encouraging an active market in listed securities based on the effective determination of prices and fair and transparent trading, providing modern and effective facilities and equipment for trading the recoding of trades and publication of prices, monitoring and regulating market trading, coordination with the JSC as necessary, to ensure compliance with the law, a fair market and investor protection, setting out and enforcing a professional code of ethics among its member directors and staff, Ensuring the provision of timely and accurate information of issuers to the market and disseminating market information to the public. (exchange.jo, March 2008)

4.4 Securities Depository Center (SDC)

The Securities Depository Center (SDC) of Jordan is a public utility institution established in the Kingdom by virtue of the Securities Law No (23) of 1997. The Securities Law of 1997 separated the functions of the Amman Financial Market (AFM) and created the Jordan Securities Commission (JSC), the Amman Stock Exchange (ASE) and the Securities Depository Center (SDC). The SDC commenced operation in May 1999, as a private non-profit institution with administrative and financial independence, run by a seven member board of directors. SDC is the only entity in Jordan that is legally empowered to oversee the following responsibilities: The SDC is one of the major institutions in Jordan's Capital Market as it holds the ownership register of all issued shares. It has been assigned, in cooperation with the JSC and the ASE, the task of bringing about a qualitative leap in market efficiency. The SDC has been recognized by the Association of National Numbering Agencies (ANNA) and the JSC as the sole numbering agency in Jordan for the assignment of International Security Identification Numbers (ISIN). All share books at the SDC are numbered according to the ISIN numbering scheme. The Securities Law No. (76) Of 2002 specified the responsibilities of the SDC to include the registration, safekeeping, transfer of ownership, deposit and clearing and settlement of securities. In order for the SDC to perform its

operations, it was necessary to establish a central registry and depository of authenticated shareholders along with a central settlement process. This ensures that the registers of all public shareholding companies are held and maintained at the SDC in electronic form. March 2008 (sdc.com.jo).

4.5 Market Divisions

Trading in shares at the ASE takes place in two markets, the Primary Market and the Secondary Market. The markets are divided according to liquidity and company profit criteria. Listing Requirements on the First Market are:

a) The shares must have been previously listed for one full year in the Second Market.

b) The Net Shareholders' Equity must not be less than 100% of the paid-in capital.

c) The company must have earned net pre-tax profits for at least two out of the last three years.

d) The Free Float in the company must not be less than:

5% if the paid in Capital is JD50 Million or more.

10% if the paid in Capital is less than JD50 Million.

e) The number of shareholders must be 100 or more.

f) The days of company trading must not be less than 20% of the overall trading days over the last twelve months and at least 10% of the free float shares must have been traded in for the same period.

Company shares can be transferred from the first market to the second market in any of the following cases:

a) Decrease of shareholders' equity to less than 75% of the paid-in capital.

b) Losses in the company financial statements in the last three successive years.

c) The free float of the company drops below the established limits.

d) The number of shareholders becomes less than 75.

e) The number of company trading days is below the established limits during the fiscal year.

f) If the percentage of company shares traded is under the established limit during the fiscal year, (exchange.jo, March 2008).

4.6 ASE Trading System

A year following its establishments, the ASE initiated a modernization, upgrading and automation program for its trading environment. The ASE made a successful transition from the manual system to an Electronic Trading System (ETS). The transition enabled financial brokers to execute buy and sell orders via a highly efficient and advanced electronic system that provides a very easy, flexible and safe mechanism operating on a continuous auction basis. Brokers enter their buy and sell orders on the ETS. Orders are matched and priority is given to execution at the best prices. The ETS provides user-friendly option to enter, change, cancel, access and execute orders. It enables market monitoring either on-line or at predetermined times, as well as providing information on market depth. The system also has the capability of making unannounced orders (hidden orders) so that voluminous orders do not have negative impact on price stability. The ETS provide tools for controlling and managing all user-trading operations, (exchange.jo, March 2008).

Chapter Five: Data and Methodology

5.1 Introduction

In order to test the study's hypothesis, the study will apply the two models, Markowitz and the Single-Index model, using the stock market price index which includes the stocks of all companies listed in ASE. The data will cover the period of 7 years over the period 1/1/2000-31/12/2006. Which represent the recently period at the beginning of third millenium, also in which the ASE performance indicators revealed remarkable performance.

5.2 Data source

Evaluation of the relative effectiveness of the Markowitz and SIM Models, using the stock market price index which includes the stocks of all companies listed in ASE. Since stock price index reflects both the risks and the returns of the traded common stocks of Amman Stock Exchange, this index is constructed by including prices of all the securities traded in ASE. The behavior of this index will be examined by using some statistical procedures to determine the variability of the stock returns in ASE over the period 2000-2006.

5.3 Sample of the study

The study sample consist of 115 stocks listed in ASE. The selection of sample is based on the following criteria:

1. Arab Bank is excluded from the sample because of its stock split.
2. Since the study covers a period of 2000-2006, only those companies, whose common stocks were listed before January, 2000 is selected as a sample.
3. Also companies that did not continued trading up to December, 2006 were excluded from the sample.

4. The data for the study have been collected from the publications and home pages of ASE.

5.4 Methodology of the study:

The methodology of the study is based by applying two models: The first one is Markowitz (1952) and the second one is Sharpe (1964) .

The study used monthly return on stocks for each company, the actual (realized) return on each stock calculated by: (the equation from (1) to (4) are adapted from Al-Qudah, Al-Khouri & Ahmad, 2004).

$$R_{i,t+1} = \frac{P_{i,t+1} - P_{i,t}}{P_{i,t}} \quad (1)$$

Where

$R_{i,t+1}$: Is the return on stock i at month t+1.

$P_{i,t}$: Is the closing price of stock i at month t+1.

$P_{i,t+1}$: Is the closing price of stock i at month t+1.

The average rate of return for each

$$\overline{R_i} = \frac{\sum_{t=1}^{n} R_{i,t+1}}{n} \quad (2)$$

stock over the study period (7 years) is:

Where

$\overline{R_i}$: Is the average rate of return for stock i .

$R_{i,t+1}$: Is the monthly rate of return for stock i.

n : Is the number of holding months of stock i.

And the stock's variance is:

$$\sigma_{Ri}^2 = \frac{\sum_{t=1}^{n}\left(R_{i,t+1} - \overline{R_i}\right)^2}{n-1} \qquad (3)$$

Where .

σ_{Ri}^2 : is variance of stock i .

$\overline{R_i}$: is the average rate of return for stock i.

$R_{i,t+1}$: is the rate of return for stock i at month t .

n : is the number of holding months of stock i.

The covariance between any two stocks in the portfolio, for example j and i is found by the following formula

$$Cov(R_i, R_j) = \frac{\sum_{i=1}^{n} \left[\left(R_{i,t} - \overline{R_i} \right) \left(R_{j,t} - \overline{R_j} \right) \right]}{n-1} \quad (4)$$

Where

$R_{i,t}$: is the return on stock i at month t.

$R_{j,t}$: is the return on stock j at month t.

n : is the number of observations

The expected return on a portfolio is given by: (the equation from (5) to (9) are adapted from Jones 1991).

$$E(R_{p,t+1}) = \sum_{i=1}^{n} W_i E(R_i) \quad (5)$$

Where

n : is the number of securities in the portfolio.

Wi : is the proportion (weight) of invested funds in security i (i=1 to n).

$E(Ri)$: is the expected return on security i (i=1 to n)

The risk of a portfolio is given by:

$$Var(Rp) = \sum_{i=1}^{n} W_i^2 Var(R_i) + \sum_{i=1}^{n} \sum_{\substack{j=1 \\ i \neq j}}^{n} W_i W_j Covariance(R_i, R_j) \quad (6)$$

Where

$Var(Rp)$: is the variance of the returns in the portfolio,

$Var(Ri)$: is the variance of the returns on security i

Wi : is the proportion (weight) of invested funds in each of the securities in the portfolio.

$Covariance(Ri, Rj)$: is the covariance between the returns of securities i and j.

The covariance expression covariance Ri, Rj is given by:

$$Covariance(R_i, R_j) = \rho_{i,j} SD(R_i) SD(R_j) \quad (7)$$

Where

$\rho_{i,j}$: is the correlation coefficient which measures the extent to which the returns on securities i and j are linearly related

SD : is the standard deviation of securities i and j.

If we substitute expression (7) in expression (6) we have:

$$Var(Rp) = \sum_{i=1}^{n} W_i^2 Var(Ri) + \sum_{i=1}^{n} \sum_{\substack{j=1 \\ i \neq j}}^{n} (Wi)(Wj)(rij) SD(Ri) SD(Rj) \tag{8}$$

From expression (6) or (7), one realizes that the risk of a portfolio is a weighted average of the individual securities in the portfolio plus the covariance between each security and every other security in the chosen portfolio.

Following Markowitz, Sharpe suggested the single index model to make the calculation of risk more practical, the essence of this model is that all shares are affected by movement of the market in general.

The SIM can be expressed by:

$$R_{i,t} = a_i + \beta_i R_{M,t} + e_{i,t} \tag{9}$$

Where

Ri,t : is the return on security i in time period t

$R_{M,t}$: is the return on the market index in time period t.

a_i : is the constant term

β_i : is the sensitivity of stock i return to the return of the market

$e_{i,t}$: is the residual error term period t.

Using the single index model, one needs to estimate the following expressions:

$$\sigma^2(R) = \beta^2\sigma^2(R_m) + \sigma^2(\varepsilon) \tag{10}$$

$$\sigma^2(\varepsilon) = \sigma^2 r - \beta^2\sigma^2(R_m) \tag{11}$$

$$Cov(R_i, R_j) = \beta_i\beta_j\sigma^2(R_M) \tag{12}$$

Where

$\sigma^2(R)$: is the variance of the return.

β : is the beta which represents the systematic risk.

$\sigma^2(\varepsilon)$: is the residual variance (unsystematic risk).

$\sigma^2(R_m)$: is the variance of market return. (Haugen2001).

The return on each share as well on the market index is calculated as follows:

$$R_{t=}(p_t - p_{t-1}) / p_{t-1} \tag{13}$$

Where p_t is the price level of a share or index in time period t.

5.5 Simulation process

In order to examine the relationship between the Markowitz and the Single-Index model, 35 equally weighted portfolios with two sizes of portfolio: ten stocks and five stocks have been generated. The size (10 stock portfolio) generated 12 portfolio based upon queuing randomize portfolio and the second one based upon split of the 12 portfolios. The goal of portfolio size split is to examine that the portfolio size effect the relation between the two selection models or not.

Chapter Six:

Data Analysis

6.1 Primary Analysis

The main objective of this study is to test whether or not full covariance matrix (Markowitz) and Sharpe models of portfolio selection offer better investment alternatives to investors in ASE. To test the hypotheses generated, we have conduct a primary analysis, monthly mean rates of return, variances, and betas. The results obtained by using both Excel and SPSS are summarized in table (6-1).

Table (6-1)

Return, variance, and Beta of the Stocks included in the analysis

Over the Period [1/1/2000-31/12/2006] prepared by researcher

Stock Code	Mean Return	Variance	Beta	Stock Code	Mean Return	Variance	Beta
1	0.0140	0.0131	0.8816	59	0.0110	0.0094	0.4156
2	0.0102	0.0115	0.8245	60	0.0177	0.0348	0.5444
3	0.0211	0.0132	0.8457	61	0.0072	0.0059	0.4332
4	0.0138	0.0227	1.0146	62	0.0126	0.0104	0.4585
5	0.0139	0.0073	0.8264	63	0.0258	0.0170	0.2183
6	0.0210	0.0118	1.0675	64	0.0006	0.0000	-0.0048
7	0.0198	0.0117	0.9983	65	0.0002	0.0050	0.0567
8	0.0249	0.0137	0.6813	66	0.0191	0.0102	0.8418
9	0.0227	0.0265	0.6326	67	-0.0066	0.0068	0.2136
10	0.0212	0.0144	1.1432	68	0.0132	0.0078	0.4050
11	0.0271	0.0173	1.0430	69	0.0024	0.0125	0.4651
12	0.0177	0.0060	0.0699	70	0.0111	0.0043	0.2340
13	0.0072	0.0055	0.5055	71	0.0193	0.0170	0.6717
14	0.0088	0.0078	0.3317	72	0.0130	0.0115	0.3515
15	0.0100	0.0059	0.4556	73	0.0091	0.0133	0.0783
16	0.0143	0.0130	0.5202	74	0.0324	0.1582	0.4407
17	0.0091	0.0147	0.9834	75	0.0115	0.0120	0.6853
18	0.0222	0.0321	1.0272	76	-0.0023	0.0076	0.3124
19	0.0208	0.0205	0.3896	77	-0.0003	0.0100	0.4054
20	0.0055	0.0096	0.2808	78	-0.0037	0.0028	0.1758
21	0.0159	0.0162	0.1936	79	0.0000	0.0000	0.0000
22	0.0087	0.0082	0.0190	80	0.0309	0.0093	0.4440
23	0.0104	0.0132	0.5376	81	0.0134	0.0116	0.6612
24	0.0173	0.0065	0.1856	82	0.0019	0.0118	0.3498
25	0.0052	0.0174	0.5560	83	0.0111	0.0140	0.6683
26	-0.0159	0.0037	0.0789	84	0.0277	0.0181	0.3553
27	0.0058	0.0133	0.8069	85	0.0194	0.0081	0.3851
28	0.0025	0.0140	0.7112	86	0.0635	0.2766	3.6427
29	0.0157	0.0175	0.1869	87	0.0025	0.0264	0.2350
30	-0.0007	0.0039	0.0189	88	0.0177	0.0271	0.9535
31	0.0092	0.0167	0.4753	89	0.0297	0.0438	0.1457
32	0.0164	0.0110	0.7825	90	-0.0065	0.0013	0.0579
33	0.0096	0.0164	0.4677	91	0.0252	0.0250	1.2475
34	0.0054	0.0073	0.4379	92	0.0289	0.0198	0.6824
35	0.0142	0.0092	0.2843	93	0.0071	0.0165	0.1069
36	0.0509	0.0274	1.0875	94	0.0142	0.0056	0.5273
37	0.0036	0.0139	0.7248	95	0.0266	0.0178	0.6509
38	0.0217	0.0410	0.8960	96	0.0104	0.0089	0.4262
39	0.0235	0.0161	0.5384	97	-0.0009	0.0001	0.0133
40	0.0129	0.0096	0.4009	98	0.0190	0.0184	0.6516
41	0.0207	0.0303	0.7789	99	0.0140	0.0093	0.2398
42	0.0156	0.0133	1.1810	100	0.0048	0.0163	0.2188
43	-0.0074	0.0020	0.0987	101	0.0165	0.0181	0.5768
44	0.0031	0.0041	0.0376	102	0.0322	0.0358	-0.1008
45	0.0282	0.0161	0.3624	103	-0.0044	0.0196	0.0685
46	0.0008	0.0153	0.3701	104	0.0316	0.0234	0.5548
47	0.0067	0.0070	0.6728	105	0.0160	0.0168	-0.2276
48	0.0218	0.0137	0.2685	106	0.0130	0.0287	0.5245
49	0.0091	0.0058	0.6884	107	0.0180	0.0053	0.2456
50	0.0255	0.0320	1.0476	108	0.0182	0.0111	0.0512
51	0.0147	0.0131	0.7137	109	0.0111	0.0167	0.8556
52	0.0314	0.0465	2.04992	110	0.0250	0.0095	0.2712
53	0.0159	0.0197	0.81273	111	0.0121	0.0140	0.6314
54	0.0308	0.0346	1.49888	112	0.0006	0.0002	0.0021
55	0.0292	0.0265	0.82374	113	0.0056	0.0070	0.5031
56	0.0312	0.0399	1.28672	114	0.0121	0.0092	0.1828
57	0.0210	0.0161	1.23943	115	0.0144	0.0289	0.3121
58	0.0098	0.0076	0.80502				

We can conclude that stock returns have asymmetrical normal distribution of stocks return skewed to right (positive skewness).

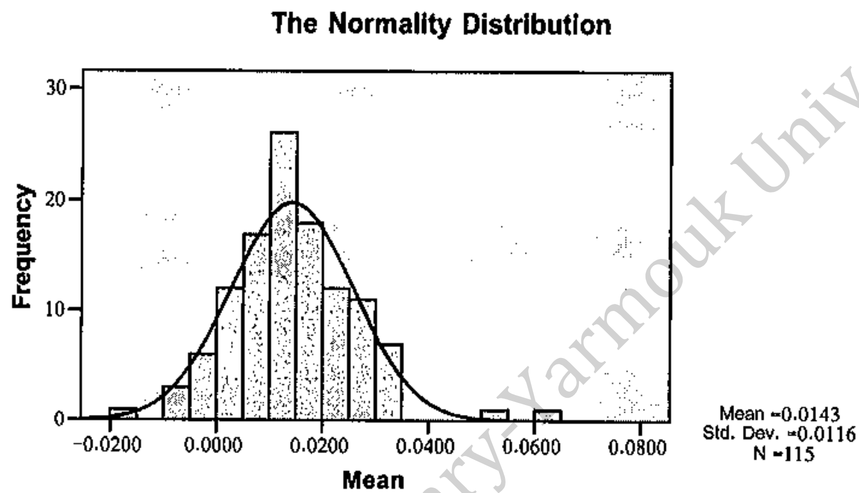


Figure (6-1)

The Normal Distribution of the Stocks Mean Rate of Returns

6.2 Hypotheses Testing

H10: There is no difference in analytical process for portfolio selection in term of risk, based on the Markowitz and single index models, in ASE.

H11: There is a difference in analytical process for portfolio selection in term of risk, based on the Markowitz and single index models, in ASE.

H20: The Single Index is not a better investment alternative as a portfolio selection model in ASE.

H21: The Single Index is a better investment alternative as a portfolio selection model in ASE.

H30: The Markowitz model is not a better investment alternative as a portfolio selection model in ASE.

H31: The Markowitz model is a better investment alternative as a portfolio selection model in ASE.

The next step involved computing the variance for each portfolio generated to determine the relationship between the two selection models. To examine this relationship, stocks were randomly selected to simulate equally weighted portfolios of two sizes 5 and 10 stock portfolios. 23 portfolios from the first size and 12 portfolios from the second size were generated. The randomize selection based upon queuing randomize portfolio selection. The results obtained, are illustrated in table (6-2).

Table (6-2)

Portfolios Variance according the two Portfolio Selection Models

No. of Stocks in the Portfolio	Markowitz Variance	SIM.Variance
5	0.0023	0.0021
5	0.0038	0.0028
5	0.0051	0.0042
5	0.0030	0.0025
5	0.0024	0.0026
5	0.0038	0.0033
5	0.0071	0.0067
5	0.0053	0.0037
5	0.0043	0.0038
5	0.0020	0.0021
5	0.0061	0.0063
5	0.0202	0.0212
5	0.0071	0.0054
5	0.0048	0.0036
5	0.0061	0.0059
5	0.0022	0.0022
5	0.0041	0.0038
5	0.0034	0.0037
5	0.0038	0.0041
5	0.0026	0.0025
5	0.0039	0.0040
5	0.0034	0.0035
5	0.0039	0.0037
5	0.0039	0.0037
10	0.0017	0.0014
10	0.0028	0.0021
10	0.0021	0.0020
10	0.0035	0.0031
10	0.0019	0.0019
10	0.0086	0.0088
10	0.0037	0.0028
10	0.0024	0.0025
10	0.0023	0.0022
10	0.0020	0.0019
10	0.0026	0.0023

Table (6-2) is simply illustrates the relationship between Markowitz model and single index model. The above table shows that the two selection models have nearly similar results, which indicates that there is no significant difference between the two selection models. Tables (6-3) presents a descriptive summary of table (6-2).

Table (6-3)

Descriptive Summary I

Description	Markowitz Model	SIM Model
Mean	0.0042	0.0039
Min	0.0017	0.0014
Max	0.0202	0.0212
Standard Deviation	0.0032	0.0034

As shown in the above table, while the mean for Markowitz model equal (0.0042), and (0.0039) for the SIM model, which is support the above result.

Table (6-4)

5 stocks Portfolios Variance according the 2Portfolio Selection Models.

No. of Stocks in the Portfolio	Markowitz Variance	SIM.Variance
5	0.0023	0.0021
5	0.0038	0.0028
5	0.0051	0.0042
5	0.0030	0.0025
5	0.0024	0.0026
5	0.0038	0.0033
5	0.0071	0.0067
5	0.0053	0.0037
5	0.0043	0.0038
5	0.0020	0.0021
5	0.0061	0.0063
5	0.0202	0.0212
5	0.0071	0.0054
5	0.0048	0.0036
5	0.0061	0.0059
5	0.0022	0.0022
5	0.0041	0.0038
5	0.0034	0.0037
5	0.0038	0.0041
5	0.0026	0.0025
5	0.0039	0.0040
5	0.0034	0.0035
5	0.0039	0.0037
5	0.0039	0.0037

Tables (6-5) presents a descriptive summary of table (6-4).

Table (6-5)

Descriptive Summary II

Description	Markowitz Model	SIM Model
Mean	0.0047	0.0044
Min	0.0020	0.0021
Max	0.0202	0.0212
Standard Deviation	0.0035	0.0037

As shown in the above table, while the mean for Markowitz model equal (0.0047), and (0.0044) for the SIM model, which is support the above result.

Table (6-6)

10 stocks Portfolios Variance according the 2Portfolio Selection Models.

No. of Stocks in the Portfolio	Markowitz Variance	SIM.Variance
10	0.0017	0.0014
10	0.0028	0.0021
10	0.0021	0.0020
10	0.0035	0.0031
10	0.0019	0.0019
10	0.0086	0.0088
10	0.0037	0.0028
10	0.0024	0.0025
10	0.0023	0.0022
10	0.0020	0.0019
10	0.0026	0.0023

Tables (6-7) presents a descriptive summary of table (6-6).

Table (6-7)

Descriptive Summary III

Description	Markowitz Model	SIM Model
Mean	0.0031	0.0028
Min	0.0017	0.0014
Max	0.0086	0.0088
Standard Deviation	0.0019	0.0020

As shown in the above table, while the mean for Markowitz model equal (0.0031), and (0.0028) for the SIM model, which is support the above result.

6.3 Statistical Test Analysis

The last result is not enough to test the relationship between Markowitz and Single Index Model as they involve no statistical testing. For this purposes F-Test and correlation statistics are employed.

6.4 F-Test Analysis

Great statistician R. A. Fisher, the statistic (F) is the ratio of two s squares (i.e. estimates of a population variance, based on the information in two or more random samples). When employed in the procedure entitled ANOVA, the obtained value of F provides a test for the statistical significance of the observed differences among the means of two or more random samples. In statistical hypothesis testing, the p-value is the probability of obtaining a value of the test statistic at least as extreme as the one that was actually observed, given that the null hypothesis is true. The fact that p-values are based on this assumption is crucial to their correct interpretation, considering as significant p-values closer to 0 (zero)). (www.wikipedia.com).

The F-test applied for the table (6-3), results that showed in the table (6-8), and the F-value reached to **α =0. 12**, the statistical standard significant at **α ≤ 0.05** which indicate that the F-test result is insignificant.

Table 6-8: F-test of (Markowitz) versus (SIM) I					
Level	**N**	**Mean**	**Std. Dev**	**F Value**	**P-Value**
1	**35**	**0.0042**	**0.0032**	**0. 12**	**0.725**
2	**35**	**0.0039**	**0.0033**		
Sig at α ≤ 0.05					

Note: level 1 = Markowitz Variance & level 2 = Single Index Variance.

From the table (6-8), it is clear that the effectiveness score for level 1 and for level 2 are relatively the same. The difference between the two means is very small (0.003) and the P-value α = 0.725, which means statistically insignificant.

The F-test applied for the table (6-4) which is include 5 stocks portfolios, results that showed in the table (6-9), and the F-value reached to **α =0. 08**, the statistical standard significant at **α ≤ 0.05** which indicate that the F-test result is insignificant.

Table 6-9: F-test of (Markowitz) versus (SIM) II					
Level	N	Mean	Std. Dev	F-Value	P-Value
1	24	0.0047	0.0035	0.08	0.779
2	24	0.0044	0.0037		
Sig at α ≤ 0.05					

From the table (6-9), it is clear that the effectiveness score for level 1 and for level 2 are relatively the same. The difference between the two means is very small (0.003) and the P-value α = 0.779, which means statistically insignificant.

The F-test applied for the table (6-7) which is include 10 stocks portfolios, results that showed in the table (6-10), and the F-value reached to **α =0. 08**, the statistical standard significant at **α ≤ 0.05** which indicate that the F-test result is insignificant.

Table 6-10: F-test of (Markowitz) versus (SIM) III					
Level	N	Mean	Std. Dev	F-Value	P-Value
1	11	0.0030	0.0019	0.08	0.784
2	11	0.0028	0.0020		
Sig at α ≤ 0.05					

From the table (6-10), it is clear that the effectiveness score for level 1 and for level 2 are relatively the same. The difference between the two means is very small (0.002) and the P-value α = 0.784, which means statistically insignificant.

From the previous results of One Way Anova tests , we observed that while the number of stock in portfolio increases from 5 stock to 10 stock in each portfolio constructed, is do not affect the result of comparing the two portfolio selection models.

6.5 Correlation Analysis

While F-Test analysis giving us an insignificant difference between the Markowitz portfolio variance and the SIM portfolio variance. It seems very important to have some analysis about the correlation of this relationship. As a result we conduct a Pearson correlation analysis, and we obtained a (0.987) correlation, nearly a perfect positive correlation which shows that the relationship between the Markowitz portfolio variance and the SIM portfolio variance is a positive relation.

The F-tests and correlation analysis did prove the existence of an insignificant difference between Markowitz portfolio variance and the SIM portfolio variance, and supported the result that there is no significant difference between the two selection models. And denied the hypothesis that says there is a difference in analytic process in term of risk for portfolio selection based on the Markowitz and SIM.Also the results denied the hypothesis that says the Markowitz model is the better investment alternative as a portfolio selection model.

The main result of our study is identical to the result of omet 1994 one.

Chapter seven: Results& Recommendations

7.1 The results

After the previous analysis, we can summarize the important results obtained by the following:

- The results showed how close the (SIM) model to (Markowitz) model for portfolios formed.
- The number of stocks in the portfolios constructed do not affect the result of comparing the two portfolio selection models.
- It is indifferent for investors to use whether Marko or SIM model on their portfolio selection decisions, therefore these result denied the study H2, H3 hypothesis.
- The F-test indicated the existence of an insignificant difference between the two selection models with $\alpha = 0.725$.
- The correlation analysis indicated that the relationship between the (Marko) and (SIM) models is nearly perfect positive correlation with a correlation coefficient of (0.987).

7.2 Recommendations

- As the portfolio selection models are very important risk test, the investors should take into consideration when they select their portfolios.
- These results are useful to considered by individual and institutional investors, managers, and policy makers in making decision and adopting new investment policies.
- The future research here in Jordan universities and ASE must try to concentrate on portfolio selection models.
- Build a network of research and training institutions to provide a suitable policy to face any development of any new portfolio selection models and policies.

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وردت خالية من المصدر

Appendix A

The Companies Codes

Code	Company Name
1	ARAB BANKING CORPORATION/JORDAN
2	ARAB JORDAN INVESTMENT BANK
3	BANK OF JORDAN
4	CAIRO AMMAN BANK
5	INDUSTRIAL DEVELOPMENT BANK
6	JORDAN INVESTMENT & FINANCE BANK
7	JORDAN ISLAMIC BANK
8	JORDAN KUWAIT BANK
9	JORDAN NATIONAL BANK
10	THE HOUSING BANK FOR TRADE & FINANCE
11	UNION BANK FOR SAVING & INVESTMENT
12	AL-NISR AL-ARABI INSURANCE
13	ARAB ASSURERS
14	ARAB GERMAN INSURANCE
15	ARAB JORDANIAN INSURANCE GROUP
16	ARAB LIFE & ACCIDENT INSURANCE
17	ARAB UNION INTERNATIONAL INSURANCE
18	ARABIAN SEAS INSURANCE
19	DELTA INSURANCE
20	GENERAL ARABIA INSURANCE
21	GERASA INSURANCE
22	HOLY LAND INSURANCE
23	ISLAMIC INSURANCE
24	JERUSALEM INSURANCE
25	JORDAN FRENCH INSURANCE
26	JORDAN GULF INSURANCE
27	JORDAN INSURANCE
28	MIDDLE EAST INSURANCE
29	OASIS INSURANCE
30	PHILADELPHIA INSURANCE
31	UNITED INSURANCE
32	YARMOUK INSURANCE & REINSURANCE
33	AL DAWLIYA FOR HOTELS & MALLS
34	AL SHARQ INVESTMENTS PROJECTS
35	AL-ZARQA FOR EDUCATION & INVESTMENT
36	ARAB FINANCIAL INVESTMENT
37	ARAB INTERNATIONAL HOTELS
38	CENTURY INVESTMENT GROUP
39	INTERNATIONAL FOR MEDICAL INVESTMENT

40	IRBID DISTRICT ELECTRICITY
41	JORDAN CENTRAL
42	JORDAN EXPRESS TOURISEM TRANSPORT
43	JORDAN HIMA
44	JORDAN HOTEL & TOURISM
45	JORDAN INTERNATIONAL TRADING CENTER
46	JORDAN PRESS & PUBLISHING /AD-DUSTOUR
47	JORDAN PRESS FOUNDATION / ALRA'I
48	JORDAN TRADING FACILITIES
49	JORDANIAN ELECTRIC POWER
50	JORDANIAN EXPATRIATE INVESTMENT HOLDING
51	MEDITERRANEAN TOURISM INVESTMENT
52	NATIONAL PORTFOLIO SECURITIES
53	REAL ESTATE INVESTMENT
54	UNION INVESTMENT CORPORATION
55	UNION LAND DEVELOPMENT CORP.
56	UNITED ARAB INVESTORS
57	UNITED FOR FINANCIAL INVESTMENT
58	ZARA INVESTMENT (HOLDING)
59	AL-EKBAL PRINTING AND PACKAGING
60	AMANA AGRICULTURAL & INDUSTRIAL INVESTMENTS
61	ARAB ALUMINIUM INDUSTRY
62	ARAB CENTER FOR PHARM. & CHEMICALS
63	ARAB ELECTRICAL INDUSTRIES
64	ARAB ENGINEERING INDUSTRIES
65	ARAB INVESTMENT AND INTERNATIONAL TRADE
66	ARAB POTASH
67	ARABIAN STEEL PIPES MANUFACTURING
68	DAR AL DAWA DEVELOPMENT & INVESTMENT
69	EL-ZAY READY WEAR MANUF.
70	GENERAL INVESTMENT
71	INDUSTRIAL MATCH \ JIMCO
72	INTERNATIONAL CERAMIC INDUSTRIES
73	INTERNATIONAL SILICA INDUSTRIES
74	INTERNATIONAL TEXTILE MANUFACTURING
75	INTERNATIONAL TOBACCO AND CIGARETTES
76	JORDAN CERAMIC INDUSTRIES
77	JORDAN CHEMICAL INDUSTRIES
78	JORDAN DAIRY
79	JORDAN KUWAIT CO. FOR AGR.

80	JORDAN NEW CABLE
81	JORDAN PAPER & CARDBOARD FACTORIES
82	JORDAN PETROLEUM REFINARY
83	JORDAN PHOSPHATE MINES
84	JORDAN ROCKWOOL INDUSTRIES
85	JORDAN STEEL
86	JORDAN SULPHO-CHEMICALS
87	JORDAN TANNING
88	JORDAN VEGETABLE OIL INDUSTRIES
89	JORDAN WOOD INDUSTRIES / JWICO
90	KAWTHER INVESTMENT
91	MIDDLE EAST COMPLEX FOR ENG. \GOLD STAR
92	MIDDLE EAST PHARM. AND CHEMICAL IND. & MEDICAL APPLIANCES
93	MODERN FOOD INDUSTRIES & VEG. OIL
94	NATIONAL ALUMINIUM INDUSTRIAL
95	NATIONAL CABLE & WIRE MANUFACTURING
96	NATIONAL CHLORINE
97	NATIONAL MULTI ENGINEERING IND. \ NAMICO
98	NATIONAL POULTRY
99	NATIONAL STEEL INDUSTRY
100	NATIONAL TEXTILE & PLASTIC
101	NUTRI DAR
102	PEARL SANITARY PAPER
103	RAFIA INDUSTRIES
104	READY MIX CONCRETE AND CONSTRUCTION SUPPLIES
105	THE ARAB INTERNATIONAL FOOD FACTORIES
106	THE INDUSTRIAL COMMERCIAL & AGRICULTURAL
107	THE JORDAN CEMENT FACTORIES
108	THE JORDAN PIPES MANUFACTURING
109	THE JORDAN WORSTED MILLS
110	THE PUBLIC MINING
111	UNION TOBACCO
112	UNITED GLASS INDUSTRIES
113	UNIVERSAL CHEMICAL INDUSTRIES
114	UNIVERSAL MODERN INDUSTRIES
115	WOOLEN INDUSTRIES

Appendix B

The Standard Deviation, Correlations, and Covariances between stocks and Market

Code	Standard Deviation	Correlation Coefficient	Cov ri,rm
1	0.1456	0.470	0.0032
2	0.1514	0.468	0.0030
3	0.1113	0.449	0.0031
4	0.1439	0.411	0.0037
5	0.0588	0.590	0.0030
6	0.1644	0.600	0.0039
7	0.1371	0.564	0.0037
8	0.1225	0.355	0.0025
9	0.1170	0.237	0.0023
10	0.1748	0.581	0.0042
11	0.1457	0.484	0.0038
12	0.0364	0.055	0.0003
13	0.0368	0.418	0.0019
14	0.0603	0.229	0.0012
15	0.0718	0.361	0.0017
16	0.1731	0.278	0.0019
17	0.1255	0.495	0.0036
18	0.1742	0.350	0.0038
19	0.1163	0.166	0.0014
20	0.1431	0.175	0.0010
21	0.1415	-0.093	-0.0007
22	0.1154	0.013	0.0001
23	0.1198	0.285	0.0020
24	0.1203	0.140	0.0007
25	0.0584	0.257	0.0020
26	0.0000	0.079	0.0003
27	0.1356	0.426	0.0030
28	0.1274	0.366	0.0026
29	0.0346	0.086	0.0007
30	0.0681	0.019	0.0001
31	0.0781	0.224	0.0017

32	0.1273	0.455	0.0029
33	0.0999	0.223	0.0017
34	0.1079	0.313	0.0016
35	0.0840	0.181	0.0010
36	0.0000	0.400	0.0040
37	0.0670	0.375	0.0027
38	0.0753	0.270	0.0033
39	0.1899	0.259	0.0020
40	0.0970	0.249	0.0015
41	0.1551	0.273	0.0029
42	0.1204	0.624	0.0043
43	0.1087	0.136	0.0004
44	0.0276	-0.036	-0.0001
45	0.1726	0.174	0.0013
46	0.1016	0.182	0.0014
47	0.1007	0.492	0.0025
48	0.1059	0.140	0.0010
49	0.1077	0.553	0.0025
50	0.2682	0.357	0.0039
51	0.0548	0.381	0.0026
52	0.2115	0.580	0.0075
53	0.1714	0.353	0.0030
54	0.2288	0.491	0.0055
55	0.2375	0.309	0.0030
56	0.2127	0.393	0.0047
57	0.1832	0.595	0.0046
58	0.0816	0.563	0.0030
59	0.1696	0.261	0.0015
60	0.3679	0.178	0.0020
61	0.0764	0.345	0.0016
62	0.1013	0.275	0.0017
63	0.0587	0.102	0.0008
64	0.0000	-0.058	0.0000
65	0.0000	0.049	0.0002
66	0.1035	0.508	0.0031
67	0.0918	0.158	0.0008

68	0.0480	0.280	0.0015
69	0.1856	0.254	0.0017
70	0.0059	0.216	0.0009
71	0.1288	0.314	0.0025
72	0.1032	0.200	0.0013
73	0.1183	0.041	0.0003
74	0.0000	0.068	0.0016
75	0.1265	0.381	0.0025
76	0.0818	0.218	0.0011
77	0.0630	0.247	0.0015
78	0.0327	0.201	0.0006
79	0.0000	0.000	0.0000
80	0.0734	0.280	0.0016
81	0.0488	0.374	0.0024
82	0.0790	0.196	0.0013
83	0.1387	0.344	0.0025
84	0.0824	0.161	0.0013
85	0.0682	0.260	0.0014
86	0.2236	0.422	0.0134
87	0.1124	0.088	0.0009
88	0.1615	0.353	0.0035
89	0.1006	0.042	0.0005
90	0.0000	0.098	0.0002
91	0.1838	0.481	0.0046
92	0.1260	0.296	0.0025
93	0.0000	0.051	0.0004
94	0.0616	0.429	0.0019
95	0.1592	0.298	0.0024
96	0.0459	0.276	0.0016
97	0.0000	0.097	0.0000
98	0.1516	0.293	0.0024
99	0.0827	0.152	0.0009
100	0.0000	0.105	0.0008
101	0.1331	0.262	0.0021
102	0.0667	-0.033	-0.0004
103	0.0000	0.030	0.0003

104	0.1475	0.221	0.0020
105	0.1355	-0.107	-0.0008
106	0.1040	0.189	0.0019
107	0.0807	0.206	0.0009
108	0.1698	0.030	0.0002
109	0.0935	0.404	0.0031
110	0.0261	0.170	0.0010
111	0.0566	0.325	0.0023
112	0.0000	0.010	0.0000
113	0.1492	0.366	0.0018
114	0.1082	0.116	0.0007
115	0.0493	0.112	0.0011

Appendix C

The Expected Returns of Simulated Portfolios

No. of Stocks in the Portfolio	ER(P)
5	0.0140
5	0.0089
5	0.0191
5	0.0100
5	0.0053
5	0.0172
5	0.0077
5	0.0087
5	0.0138
5	0.0092
5	0.0180
5	0.0305
5	0.0211
5	0.0156
5	0.0132
5	0.0203
5	0.0043
5	0.0133
5	0.0103
5	0.0164
5	0.0106
5	0.0189
5	0.0057
5	0.0211
10	0.0114
10	0.0145
10	0.0113
10	0.0164
10	0.0115
10	0.0243
10	0.0144
10	0.0123
10	0.0118
10	0.0135
10	0.0123

ملخص

"مقارنة نماذج إختيار المحفظة الاستثمارية لماركويتز والمؤشر المنفرد: دراسة حالة سوق عمان المالي خلال الفترة 2000-2006"

إعداد الطالب:

علي مطر

إشراف الاستاذ الدكتور:

علي المقابلة

تهدف هذه الدراسة لتطبيق نموذجي ماركويتز والمؤشر المنفرد لاختبار اداء وخطورة المحافظ الاستثمارية المؤلفة في سوق عمان المالي .البيانات التي استخدمت في الدراسة كانت عبارة عن اسعار الاغلاق الشهرية للأسهم ومؤشر بورصة عمان. اعتمدت طريقة الدراسة على تحليل البيانات لـ 115 شركة مدرجة في بورصة عمان خلال الفترة (2000-2006). أهمية هذه الدراسة تنشأ من تطبيق هذه النماذج, يعطي خيارات أفضل لمتخذ القرار في اختيار المحفظة المالية المثالية في سوق عمان المالي. أظهرت النتائج الى أنه لا يوجد فرق ذي دلالة احصائية بين النماذج المستخدمة. وأن عدد الأسهم في المحافظ التي شُكلت لا تُؤثرُ على نتيجةِ مُقارَنَة نموذجي اختيار المحفظة . بما أن نماذج اختيار المحافظ الاستثمارية مهم جدا في قياس المخاطر يجب على المستثمرين أخذهم بعين الاعتبار عند اختيارهم لمحافظهم الاستثمارية.